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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/705,868

11/13/2003

Florent Picard

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23599

7590

08/31/2006

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EXAMINER

SINGH, PREM C

ART UNIT

PAPER NUMBER

1764

DATE MAILED: 08/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/705,868

Applicant(s)

PICARD ET AL.

Examiner

Prem C. Singh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 10-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 10-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 July 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>07/25/06</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Amendment to claims 1, 4, 5, 11, 12, and 14; cancellation of claim 9; and addition of new claims 15-23 is noted.

Claim Objections

Claims 5 and 14 are objected to because of the following informalities:

Claims 5 and 14 refer to a "dyhyd~~6~~desulfurization" step. It is not clear from the specifications how this step is conducted.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-8, and 10-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parker (US Patent 3,457,163) in view of Lee et al (US Patent 6,551,502).

Parker invention discloses charging straight-run naphtha fractions containing about 5% aromatic hydrocarbons to a pyrolysis unit. The pyrolysis effluent is separated in to desired fractions, one fraction of which usually comprises C₅-400°F (204°C)

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pyrolysis gasoline which represents, for example, approximately 1 to 40% by weight of the original naphtha feed, depending upon the charge stock characteristics and severity of cracking. Since the pyrolysis gasoline is heavily contaminated, as previously mentioned, it is usually hydrotreated for saturation of the olefins and/or diolefins and/or removal of sulfur compounds. Not infrequently, the prior art schemes also charge the hydrotreated pyrolysis gasoline fraction to an aromatic extraction unit for recovery of the aromatic hydrocarbons such as benzene, toluene, and xylene therefrom. Typical extraction procedures utilizing a solvent such as sulfolane or the glycols are well known to those skilled in the art for aromatic extraction purpose (Column 1, lines 65-72; column 2, lines 1-10).

Parker invention further discloses a two-stage method for stabilizing sulfur-containing pyrolysis gasoline which comprises the steps of: (a) introducing an unstable pyrolysis gasoline feedstock containing diolefins, olefins, sulfur compounds and pre-formed gum-like compounds; (b) withdrawing from said first zone a distillate fraction comprising C₅-400°F (204°C) hydrocarbons including diolefins and olefins and a residual fraction containing gum-like compounds; (c) admixing said distillate fraction with hydrogen and introducing the admixture into a first reaction zone containing a palladium catalyst under conditions including a temperature from 200°F to 500°F (93 to 260°C) , pressure from 100 to 1200 psig (0.69 to 3.4 MPa), liquid hourly space velocity from 1 to 10, based on total hydrocarbon charge and a molar excess of hydrogen sufficient to convert dienes to olefins without substantial conversion of sulfur compounds to hydrogen sulfide; (d) introducing the total effluent from said first reaction

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zone in substantially vaporous form into a second separation zone (Column 3, lines 19-38). (f) passing remaining hydrocarbon containing sulfur compounds from said second separation zone into a second reaction zone containing desulfurization catalyst under hydrogenating conditions including the presence of a molar excess of hydrogen, a temperature from 550° to 750°F, pressure from 400 to 800 psig, liquid hourly space velocity from 1 to 10, sufficient to substantially convert sulfur compounds to hydrogen sulfide ; and (g) recovering stabilized pyrolysis gasoline in high concentration (Column 3, lines 44-54). Also, it is distinctly preferred to practice this invention utilizing the two reactor system wherein the first reactor contains palladium catalyst and operates relatively at low temperature with the second reactor containing a nickel catalyst with operations being performed at a relatively high temperature (Column 7, lines 32-37).

Parker invention does not disclose using a metal from Group VI B in hydrogenation step.

Parker invention does not mention gasoline feed from FCC unit.

Parker invention does not mention the molar ratio of hydrogen and diolefins.

Parker invention does not disclose the details of the solvent extraction unit.

Parker discloses, "It is distinctly preferred to practice this invention utilizing the two reactor system wherein the first reactor contains palladium catalyst and operates at relatively low temperature with the second reactor containing a nickel catalyst at a high temperature." (Column 7, lines 32-37). Further, Parker discloses, "A particularly useful

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catalyst for desulfurization and olefin saturation in the second reaction is for example, nickel molybdate supported on alumina.” (Column 4, lines 23-26).

Knowing the fact that molybdenum belongs to Group VI B, it would have been obvious to one skilled in the art at the time the invention was made to add a catalyst from Group VI B in the hydrogenation step to improve olefin saturation. It would have been obvious to put the two catalysts together (in one reactor), which is a common practice in the art to save space and making the process more economical.

It would have been obvious to use gasoline from FCC unit because the gasoline from pyrolysis unit and FCC units are similar in physico-chemical characteristics and contain similar components.

Knowing the hydrogen flow rate and the content of diolefins in the feed, it would have been obvious to use a molar ratio of 1 to 10 for selective hydrogenation of the diolefins.

Lee invention discloses an extractive process to simultaneously extract sulfur compounds and reject olefinic compounds in the hydrocarbon stream. Particularly preferred streams for use with the invention are derived from, for example, a coker naphtha source, a thermal steam cracked source, or a fluid catalytic cracker (FCC) unit (Column 1, lines 43-49). According to the invention, only the extract stream with the sulfur-concentrates is hydrodesulfurized with the conventional or improved HDS unit (Column 1, lines 63-65). Extractive processes within the scope of the invention include extractive distillation (ED) or liquid-liquid extraction (LLE). The full range of the FCC

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gasoline is fed to an extractive process where a proper extractive solvent or mixed solvent is used to extract the sulfur compounds and aromatics into an extract stream. At the same time, olefinic, naphthenic, and paraffinic compounds in the gasoline stream are rejected by the solvent into a raffinate stream (Column 2, lines 32-38). A generalized embodiment is depicted schematically in figure 1 (Column 2, lines 61-62). Light naphtha fraction (18) is fed to an extractive process unit (20) (for example a liquid-liquid extraction or extractive distillation column) while heavy naphtha fraction (21) is fed to the hydrotreating unit (28) (Column 3, lines 3-6). The non-limiting solvent examples include sulfolane, 3-methylsulfolane, 2, 4-dimethylsulfolane, 3-ethylsulfolane, N-methyl pyrrolidone, 2-pyrrolidone,ethylene glycol, propylene carbonate and mixtures thereof (Column 4, lines 66-67; column 5, lines 1-10).

It would have been obvious to one skilled in the art at the time the invention was made to combine Parker and Lee inventions and use the detailed information about solvent extraction unit for proper removal of sulfur from the hydrocarbon stream.

Response to Arguments

The Applicant argues that it will not be obvious to combine the teachings of Parker and Lee because of the different feed stocks and the different problems that are addressed: one for removing gum-like compounds and from pyrolysis gasoline and the other the removal of sulfur-containing compounds from FCC gasoline.

The Applicant's argument is not persuasive because although Parker uses pyrolysis gasoline, the invention discloses, "It is known in the art that one of the commercially attractive routes to the production of valuable normally gaseous olefinic hydrocarbons, such as ethylene, propylene, etc. is the thermal cracking or pyrolysis of hydrocarbons such as the light paraffin hydrocarbons and/or naphtha fraction obtained from petroleum. Usually, the pyrolysis reaction is effected at high temperatures in presence of superheated steam in cracking furnace coils. In addition to these light olefinic gases, there is also produced a significant quantity of pyrolysis gasoline." (Column 1, lines 36-54). Thus, Parker invention clearly indicates that the gasoline used here is the same as a thermally cracked gasoline, or steam cracked gasoline. Lee discloses, " A coker naphtha source, a thermal steam cracked source, or a FCC unit." (Column 1, lines 46-49). Thus, a feed stream of thermally cracked naphtha and FCC naphtha should react like wise in the process. Also, Parker is not only removing gum-like compounds, as stated, "The invention provides a method for removing diolefins without destroying the olefins, while simultaneously removing diolefins, olefins, and sulfur compounds from the aromatic portion of the pyrolysis gasoline." (Column 2, lines 54-57). Thus, Parker invention is a two-stage hydrogenation process for stabilizing pyrolysis gasoline.

It is to be noted that Lee invention discloses the details of the solvent extraction, which is suggested by Parker without providing details (Column 2, lines 7-10).

Thus, it would have been obvious to one skilled in the art at the time the invention was made to combine the Parker and Lee inventions, take the feed to the

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Parker hydrogenation unit, and then the effluents to the solvent extraction unit of Lee.

This arrangement will produce high-octane gasoline with substantially reduced diolefins and aromatics.

The Applicant argues that the claimed invention adds a VI B catalyst so as to form a bimetallic catalyst.

As mentioned earlier, Parker discloses, "It is distinctly preferred to practice this invention utilizing the two reactor system wherein the first reactor contains palladium catalyst and operates at relatively low temperature with the second reactor containing a nickel catalyst at a high temperature." (Column 7, lines 32-37). Further, Parker discloses, "A particularly useful catalyst for desulfurization and olefin saturation in the second reaction is for example, nickel molybdate supported on alumina." (Column 4, lines 23-26).

It is to be noted that nickel belongs to Group VIII and molybdenum belongs to Group VI B. Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Parker invention and add a Group VI B element in the Group VIII element for effective olefin saturation (and additionally, desulfurization) of the gasoline and produce a high octane blending component.

The Applicant disagrees that pyrolysis gasolines and FCC gasolines are similar.

As mentioned earlier, combination of Parker and Lee inventions shows similarity of the two gasolines. Further, Parker discloses, "Pyrolysis gasoline feedstock containing

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diolefins, olefins, sulfur compounds, and pre-formed gum-like compounds.” (Column 3, lines 22-23). “Pyrolysis gasoline has a boiling range of C₅ to 400°F (205°C) (Column 8, lines 12-14). Lee provides a complete analysis of FCC gasoline (Column 7, Table 6) showing quantitative values of components (including the boiling range of 21.4°C to 220.6°C). One skilled in the art knows that the major components: paraffins, olefins, diolefins, aromatics, naphthenes, sulfur compounds, etc., are present in both gasolines, in different proportions. Thus, comparing the disclosures of Parker and Lee, it would have been obvious to one skilled in the art at the time the invention was made to substitute FCC gasoline for pyrolysis gasoline.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on MF 6:30 AM-3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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